

MLCPAC STANDARD SPECIFICATION 400
GENERAL INSTRUCTIONS FOR INSTALLATION, REPAIR, AND/OR RELOCATION OF
ELECTRONIC EQUIPMENT

1 GENERAL

1.1 These instructions, together with the following listed publications, provide the Contractor with specific instructions regarding electronic practices which are to be observed in the installation, relocation, repair, and/or removal of electronic equipment.

2 REFERENCES

Coast Guard Drawings: None

Enclosed Figures: None

Applicable Documents:

NAVSEA 0910-LP-062-9100; Electronic Plant Installation Standard
Methods
NAVSEA 0967-LP-000-0110; EIMB, Installation Standards, Section 2, Cable; Flexible and
Semi-Rigid
NAVSEA 0967-LP-000-0110; EIMB, Installation Standards, Section 5,
Waveguide and Rigid Coaxial Lines
NAVSEA S9AAO-AB-GOS-010; General Specifications for Overhaul of
Surface Ships
COMDTINST M10360.3A; Coatings and Color Manual (Aug 95)
MLCPAC Standard Specification 074; Welding and Allied Processes (Mar
98)
COMDTINST M10550.25; Electronics Manual (Jun 89)
Norfolk Naval Shipyard, Process Instructions No. 0409-199A
MIL-STD-188-124B; Grounding, Bonding, and Shielding for Common
Long-Haul/Tactical Communication Systems, including Ground Based
Communication Electronics Facilities and Equipment
MIL-STD-1680D (SH); Installation Criteria for Shipboard Secure
Information Processing Systems

3 REQUIREMENTS

3.1 The Contractor shall exercise all normal precautions necessary to protect Government Furnished Equipment (GFE) and materials delivered to him/her for installation/removal with the cutter. All GFE and materials shall be his/her responsibility from the time they are delivered to the Contractor until the specific contract is completed. The Contractor shall repair or renew equipment or materials damaged as a result of the Contractor's omission of adequate equipment protection and/or non compliance of the contract.

3.2 During the progress of the work the Contractor shall take all precautions necessary to adequately cover openings to the weather, interior decks/bulkheads and installed electronic/electrical equipment in order to protect equipment and structure from weather and welding/brazing damage. Special protection in the form of wood or wood and sheet metal protectors shall be provided for units containing glass panels or cathode ray tube screens. When any work such as welding, chipping, grinding, painting and/or repair of structure insulation causes the dispersion of an unusual amount of dust or molten metal, the electronic equipment decks and bulkheads, in the compartment where the dust or molten

metal is being dispersed shall be protected with tarpaulins and/or dust covers to prevent burn damage and/or dust penetration.

3.3 All brackets, hangers, stuffing tubes, cable collars, kickpipes and foundations vacated by the removal of electronic equipment, cables or associated components and not to be reused in the installation of new equipment, shall be completely removed from both sides of bulkheads and decks. All resulting holes in metal decks and/or bulkheads shall be blanked off by welding in flush watertight inserts of the same material and thickness as the surrounding area. All rough and/or burned areas left by the removal of foundations or by the welding in of inserts or new foundations shall be ground or filed smooth consistent with the adjacent areas. Conduct a dye check of all disturbed areas and repair as required with suitable filler material. All welding shall be in accordance with MLC PAC Std Spec 074. Undercutting, piling and non-penetration will not be permitted. Wooden decks and bulkheads shall be repaired with suitable wooden plugs and patches.

3.4 All deck, overhead and bulkhead surface covering and/or insulating material disturbed, damaged, cut away, removed or exposed incident to removal, relocation, or installation of equipment and/or cables shall be repaired, replaced, recovered and/or finished off with like material consistent with the adjacent areas. New foundations, brackets, hangers, cable collars, stuffing tubes, kickpipes, surfaces exposed by the removal of electronic equipment and cables and surfaces which will be made inaccessible by the installation of new electronic equipment shall be painted to match surrounding areas and in accordance with COMDTINST M10360.3 after having the surface properly prepared. Accessible areas shall be prime painted, consistent with the surrounding areas, in accordance with COMDTINST M10360.3.

3.5 Electrical wiring and cabling shall be installed in accordance with NAVSEA 0967-LP-000-0110 and NAVSEA 0967-LP-000-0110. This includes all electrical fittings, boxes, switches and equipment incident thereto. All cabling shall be installed in existing wireways where practicable, except as otherwise noted in paragraph 3.10 of this specification. Where existing wireways, deck and/or bulkhead collars cannot be used, cable runs shall be adequately supported on new cable hangers as necessary. All new cable runs shall be properly stepped. Steps may be of standard two leg formed strap design or steel pads welded to ship's structure. All cable runs shall be properly clamped. One hole clamps are permissible for securing a single cable run; all other runs require two hole clamps. "Ty-raps" are not acceptable for permanent cable run installations. Sheet metal bulkheads require no stepping for cable runs but do require metal pan stiffening along the run. New clamps are to be installed where cables are removed or added to existing runs.

3.6 Lay out the cable runs so that abrupt bends will not be necessary. The minimum bending radius for Navy/Commercial type cables (not coaxial cable) is seven times the diameter of the cable. Existing stuffing tubes and kickpipes shall be used where practicable, unless otherwise directed. Where existing bulkheads and/or deck openings cannot be used, new holes are to be cut. Stuffing tubes welded watertight continuously on both sides of the decks and/or bulkheads, shall be used where deck and/or bulkhead penetration is necessary. When kickpipes are used, the height of the stuffing tube above the deck shall be not less than nine inches. Metallic packing is required at each stuffing tube.

3.7 Cable hangers, straps and/or clamps supporting cables exposed to the weather shall be fabricated of stainless steel. All cable and electrical fittings, mounting hardware, switches and/or boxes furnished by

the Contractor, unless specifically designated as to type and/or size in the specific item of the contract, shall be standard marine types currently used in new construction. All new electrical/electronic armored cables exposed to the weather, except those specifically exempted by the specific item of the contract, shall be dip painted with one coat of Pre-treatment Wash Primer and one coat of quick drying Red Lead. With the exception of the primer coat, cables (interior and exterior) shall be painted after they have been pulled but prior to being secured in place. Support brackets (interior and exterior) shall be painted prior to installing cables.

3.8 Conductor markings of power cable connections, shall have the following format. Example: (01-158-3)4P-A

- a. Load Center identification
- b. Phase of power
- c. Load Center circuit connection

3.9 Bonding and grounding of cables used in shipboard electronics installation shall be in accordance with NAVSEA 0910-LP-062-9100, Norfolk Naval Shipyard PI No. 0409-199, MIL-STD-188-124 and MIL-STD-1680. In case of a conflict of methods, Norfolk Naval Shipyard PI No. 0409-199 shall take precedence over other documents for all installations except secure spaces, in which MIL-STD-188-124 and MIL-STD-1680 shall be the controlling documents.

- a. Steel or aluminum armored cables connected to electronic equipment are to be grounded by properly grounding the cable armor in the clamp or entering device. The DC resistance across the bonding shall not exceed 0.01 ohm.
- b. The vessels metal hull shall be used as the ground for cable armor, through the cable hanger banding, whenever possible.
- c. The DC resistance from cable armor to the hull structure shall not exceed 0.05 ohms.
- d. Completed bonds and joints, in ground circuits exposed to the weather or corrosive agents, shall be given a protective coating of paint, in accordance with paragraph 3.7.
- e. Continuity of the inner shielding of cables must be maintained through junction boxes and not grounded unless specified on applicable installation plans and/or specifications.
- f. Armor cables entering into electrical equipment cabinets, terminal boxes, switches and/or other marine devices shall have the armor jacket removed and grounded, back to the stuffing tube, cable clamp and/or equipment cabinet entrance plate.

3.10 Interconnecting electric cables used for circuits such as Radio Receiving Antenna inputs, Passive Sonar Transducer inputs, shall be run in separate wireways wherever practicable. When such separation is not practicable they may be installed in the same hangers but not closer than two (2) inches to the ship's service power and lighting cables. Cables used for transmission circuits such as Radar Trigger, Radar Modulator, Radio Transmitting, and Active SoPage 3 of 5nar, shall not be run in wireways or located closer than eighteen (18) inches to the receiving antenna, sonar transducer and similar low level cable inputs unless specifically approved by the Coast Guard. Coaxial cables installed on masts, in the beam patterns of high powered radars operating in the 200 to 450 MHz range; shall be shielded from radiation in accordance with MIL-STD-188-124B and MIL-STD-1680.

3.11 The minimum bend radius for flexible coaxial cables shall be ten (10) times the cable diameter, except when the cable is subjected to repeated flexing; in which case, the minimum bend radius shall twenty (20) times the cable diameter. The electrical properties of solid dielectric coaxial cables depend on their physical dimensions and conditions, therefore:

- a. Use prefabricated straps for holding the cables.
- b. Under no circumstances shall the strap be formed by hammering or bending around the cable.
- c. Do not overtighten the gland nut of bulkhead or stuffing tubes.
- d. Keep grease and dirt from inside coaxial cable connections during installation.
- b. Pack all stuffing tubes, on armored solid dielectric cable, with a conducting type neoprene binder material.

3.12 Where exposed to possible mechanical injury, coaxial cables and waveguides shall be protected as follows:

- a. Single small diameter coaxial cables shall be enclosed in flexible brass armor. The section of brass armor shall be grounded at both ends.
- b. Waveguides, large diameter coaxial cables and groups of coaxial cables shall be enclosed in a removable 16-gauge sheet steel or expanded metal enclosure.

3.13 Continuity checks and insulation resistance tests shall be made on all contractor installed and/or rerouted power, interconnecting/control, multiconductor and coaxial cable as follows:

- a. Continuity checks shall be made on all conductors in all cables after the installation is completed including the attachment of connectors and/or terminal lugs. This is to certify that there are no open or shorted conductors inside the cable sheath and that the connectors are correctly terminated and identified. Continuity tests of all power, interconnecting/control and multiconductor cables shall be made with a calibrated Volt-Ohm meter.
- b. Insulation measurements for power, interconnecting/control and multiconductor cables shall be made between each conductor and ground. These cables include twisted pairs, triads, shielded and unshielded, that are normally used in interior communications, power and instrumentation systems. The minimum insulation resistance values, for these cables, shall be 50,000 ohms or greater.
- c. Insulation resistance tests shall be made on coaxial cables upon completion of installation. The tests conducted shall include the installed connectors but with the cables disconnected from the equipment. A 500-volt megohmmeter, used for these tests, shall have a resistance range greater than 1000 megohms. Acceptable insulation resistance values for coaxial cables, with polyethylene or polytetrafluorethylene (Teflon) dielectric, shall equal or exceed the following:

Length (feet)	Insulation Resistance (megohms)
100	40,000
200	20,000
500	8,000
1,000	4,000

3.14 The following procedure shall be followed to maintain weathertight connections in solid dielectric coaxial cable fittings and MS series connectors exposed to the weather, in cases where no other specific instructions are issued.

- a. Coaxial Cable Connectors: Clean the entire plug. Apply dielectric compound (Dow Corning #4) to the interior and exterior including the insulation portion and the threads. Do not fill the air space in the plug with dielectric compound as this will change the impedance and cause a mismatch. Assemble the plug finger tight and tightly wrap a single layer of 3/4" synthetic resin tape with a 50 percent overlay over the entire plug and for a distance of at least two inches on each side. Then apply a layer of friction tape and at least three coats of sealing compound complying with MIL-A45106. After the sealing compound has dried, paint the weather-proofed connection to match the surrounding surfaces.
- b. For MS Series Connectors: Apply dielectric compound (Dow Corning #4) to the interior portion of the connector threads. Encapsulate the connector termination and at least three (3) inches of the interconnecting cable and/or MS series panel mount connector, with plastic electrical insulating adhesive tape. Seal this transition with three coatings of silicone sealing compound that complies with MIL-A46106. DO NOT apply silicone sealing compound directly to the metal connector surfaces as a slight corrosion will occur.

3.15 Proper installation of waveguides is important. The run shall be laid out, fabricated and installed in exact accordance with NAVSEA 0967-LP-000-0110. The waveguide run shall be as short and straight as practicable. Joints and couplings shall be kept to a minimum. Bends and twists shall be kept to a minimum. Horizontal runs should slope toward the transmitter. Before waveguides are installed, the gasket between flanges should be thoroughly cleaned with a cloth to assure good electrical contact between flanges. The gasket must not be coated with glyptol, shellac or any other material. The inside of waveguides are to be cleaned of dirt, scale, wrinkles, etc., after the completion of bending and/or

brazing to present a clean smooth unbroken surface of consistent dimension within the waveguide. Cleaning shall be in accordance with NAVSEA 0967-LP-000-0110. There shall be no dents, breaks or cracks in the waveguide. Minimum bending radius and maximum waveguide deformation allowable shall be in accordance with NAVSEA 0967-LP-000-0110. Where it is necessary to open a waveguide section on an Antenna change-out, the open ends, of waveguides, shall be protected (sealed) from the entrance of moisture and/or foreign material, and shall be blanked off with a sealing cap and/or plate and pressurized where applicable.

3.16 All workmanship shall be subject to inspection and testing at all times during the contract. All work, within the contracts scope, shall be in accordance with good engineering practice. Any deficiencies found, prior to redelivery of the cutter, will be corrected by the Contractor. The Contractor shall not mount equipment and/or accomplish work until the method and is approved by the Contacting Officer's duly authorized representative.

3.17 Suitable equipment foundations shall be provided by the Contractor for all bulkhead, deck, overhead and/or antenna systems to be installed, whether specifically cited or not.

3.18 All original notes and instructions on drawings cited by a specific item of the contract, shall be considered a part of that specific item, unless instructions to the contrary are included in the specific item of the contract. In case of a conflict with these General Specifications and specific instructions in a specific item of the contract, the instructions in the specific item shall take precedence.

3.19 All interferences and/or relocations required in order to perform the equipment installations, in accordance with a specific item of the contract or a drawing cited in a specific item of the contract, shall be accomplished by the Contractor as a part of the contract.

3.20 All work performed under this specification shall meet all special requirements and detailed instructions as set forth by NAVSEA 0910-LP-062-9100, NAVSEA 0967-LP-000-0110, MLC Std Spec 074, COMDTINST M10550.25, and manufacturer's instruction manual for specific equipment concerned. Revised:13 Apr 1999.